DATA SEGREGATION AND FRAGMENTATION IN A WIRELESS NETWORK FOR IMPROVING VIDEO PERFORMANCE

The present invention relates to communications in a wireless network. In particular, the invention related to data segregation and fragmentation in a wireless network for improving the performance of video communication.

Wireless communications are becoming very popular because allow users to move freely without being tied to a desk or wire. However, users are continually demanding greater performance and better communication with their wireless devices. Consequently, techniques that improve the performance of wireless devices are extremely useful and may have great commercial value. One aspect that can be improved has to do with the way messages are fragmented so that they may be efficiently communicated between devices.

In wireless communication standards such as 802.11 Wireless Local Area Network (WLAN) standard, a technique called fragmentation divides large messages into smaller fragments so that they can be transmitted efficiently between devices. Ordinarily, the fragment length is fixed, however, the longer the fragments the more likely that they will be corrupted during the communication. On the other hand, the smaller fragmentation length means larger overhead and more transmit and acknowledge (ACK) rounds which will decrease the system throughput. So if the channel condition is good, the longer fragment length will increase the system throughput. Some techniques for manually modifying the fragment size or for dynamically modifying the fragment size are known in the art, but they do not adequately take into account certain channel parameters and variables that would be useful for optimizing the fragment length.

In the 802.11 specification Figure 1 is provided to show the standard fragmentation process of partitioning a media access control (MAC) service data unit (MSDU) into smaller MAC level frames, MAC protocol data units (MPDUs). Fragmentation creates MPDUs smaller than the original MSDU length to increase reliability, by increasing the probability of successful transmission of the MSDU or MMPDU in cases where channel characteristics limit reception reliability for longer frames.

As described above, the conventional fragmentation technique applies the same fragmentation threshold to all data packet regardless of their importance. What is needed is a technique for identifying the data so that more important data packets can be segregated from less important data packets. The invention is directed to a technique for segregating such data, especially under the 802.11 WLAN standard.

The present invention addresses the identified problems and provides a wireless communication device with a segregation circuit, especially applied to video data under the 802.11 Wireless Local Area Network (WLAN) standard. This segregation allows the wireless communication device to achieve an increased quality of video communication and reception over the wireless communication channel.

A wireless communication device comprises an input terminal configured to communicate data with a processor. A segregation circuit is coupled to the input terminal and configured to identify predetermined data and to separate more important data from less important data. A memory is configured to store at least one parameter relevant to the wireless communication protocol. A modem is coupled to segregation circuit and the memory and is configured to communicate using a wireless protocol over a wireless channel, and includes a framer configured to fragment the segregated data based at least in part on the at least one parameter stored in the memory. In one aspect of the invention, the wireless protocol is 802.11. Advantages of the invention include the ability to achieve high quality video communication over a wireless communication link with less chance of dropping important data.

In one aspect of the invention, the memory is configured to store a fragmentation threshold parameter, which is set to be greater than the segregation circuit allocates for more important data. The framer is configured to fragment the segregated data based at least in part of the fragmentation threshold parameter.

In one aspect of the invention, the predetermined data is video data and the more important data is the video control data and the less important data is the video payload data. In one aspect of the invention, the video data is MPEG-2 format video data.

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The invention will be described with reference to the following figures in which:

Figure 1 is a diagram showing fragmentation under the 802.11 communication protocol specification;

Figure 2 is a simplified block diagram showing two wireless devices using an exemplary 802.11 communication protocol according to an embodiment of the invention;

Figure 3 is an exemplary wireless frame according to the 802.11 specification;

Figure 4 is a diagram showing an internal functional block diagram of the modem according to an embodiment of the invention;

Figure 5 is a diagram showing a data packets for a video application aspect of the invention; and

Figure 6 is a flowchart showing the inventive operating steps according to an embodiment of the invention.

The invention is described with reference to a number of embodiments, which may include specific implementations. The invention is intended to describe the best mode of the invention, but other similar techniques and technologies can be used to perform the invention. For example, reference is made to the 802.11 Wireless Local Area Network (WLAN) protocol, but other protocols may be implemented in the invention. Likewise, while reference is made to a segregation circuit for segregating more important data from less important data, the invention can also be performed in software by a processor or other device.

A. Fragmentation Using Wireless Protocol Standard (802.11)

As shown in Figure 1, a media access control (MAC) device may fragment and reassemble directed MAC service data units (MSDUs) or MAC management protocol data units (MMPDUs). Each of these fragments in referred to as a frame in communication between the wireless devices. Fragmentation is described in detail in the 802.11 specification, which is available on the Internet at the IEEE web site, http://www.ieee.org. While the specification describes standard techniques for performing fragmentation based on a fragmentation threshold, it does not teach or suggest techniques for improving certain types of communication performance by segregating more important data and less important data as described herein.

Figure 2 is a simplified block diagram showing two wireless devices 102 and 104 using an exemplary 802.11 communication protocol according to an embodiment of the invention. The exemplary devices 102 and 104 are the same so reference is made to one of the devices, e.g. 102. A modem 110 is constructed that is coupled to a memory 112 for storing communication parameters, for example a fragmentation threshold. In at least one embodiment, the fragmentation threshold can be modified by the modem, a processor or other means, but such modification is not required by the invention. A segregation circuit 150 is coupled between the modem and the Data I/O terminal. The segregation circuit performs functions described below to separate important data from less important data.

While the segregation circuit is shown as positioned between the modem and the Data I/O terminal, in the exemplary embodiment of the invention, the segregation circuit only affects the input data, which is sent to the modem to be transmitted over the wireless protocol.

Figure 3 is an exemplary wireless frame 200 according to the 802.11 specification, where the frame represents one of the fragments as described above. The modem 110 performs the fragmentation and constructs the frame including the frame body, which can be 0-2312 bytes long, depending on the fragmentation threshold stored in the memory 112.

B. Segregation and Fragmentation

Figure 4 is a diagram showing an internal functional block diagram of the modem according to an embodiment of the invention. The modem 110 includes a number of components, for example, a transmitter 160 and receiver 162. In addition, the modem includes a framer 152. As described above, the framer typically applies the same fragmentation threshold to all data uniformly. The invention further includes a segregation circuit 150 outside the modem 110 to segregate more important data from less important data based on the type of data.

In an exemplary embodiment, the predetermined data is video data, and specifically MPEG-2 data. The segregation circuit 150 is configured to identify the MPEG-2 data and to separate the more important control data from the less important payload data as described below.

In a preferred embodiment, the fragmentation threshold parameter stored in the memory is greater than the length of the important control data. In this manner, when the framer fragments the segregated data based on the fragmentation threshold parameter, the important data is not fragmented and has a greater chance of being received properly by the receiver. In most applications, the control data is significantly shorter than the fragmentation threshold, and therefore, will have significantly higher chance of being properly received as compared to less important data that is fragmented at the full length of the fragmentation threshold.

Figure 5 is a diagram showing a data packets for a video application aspect of the invention. An exemplary MPEG-2 program stream is shown, which has two functions. One is to pack the MPEG-2 Program Stream into transport formats according to the requirements of different OSI seven layers such as RTP, RCP, IP and others. The other function is to ensure that when packed into MSDU format, the PACK Header will exist solely in one MSDU rather than coexisting with the rest of the packets.

C. Method of Operation

Figure 6 is a flowchart showing the inventive operating steps according to an embodiment of the invention. In step 502, the modem receives video data (e.g. MPEG data) and identifies it as one of the classes of predetermined data which will be segregated by the segregation circuit. In step 504, the segregation circuit segregates the data into more important data (e.g. control data) and less important data (e.g. payload data). In step 506, the framer frames the segregated data based on at least one parameter stored in memory (e.g. the fragmentation threshold). In step 508, the modem transmits the data to other device(s) using the wireless protocol over the wireless link.

D. Conclusion

Advantages of the invention include the ability to achieve high quality video communication over a wireless communication link with less chance of dropping important data.

Having disclosed exemplary embodiments and the best mode, modifications and variations may be made to the disclosed embodiments while remaining within the subject and spirit of the invention as defined by the following claims.